REMARKS

Claims 1-14 are pending in the present application. Claims 1, 5, 9, and 14 have been amended. New claims 15-20 have been added. No new matter has been added to the new or amended claims. Reconsideration of the claims is respectfully requested in light of the remarks below.

Rejections of the Claims Based on Prior Art

The office action rejected claims 1, 4, 5, 8, 9 and 14 as being obvious under 35 U.S.C. §103 over U.S. Patent 5,682,274 to Brown et al. in light of U.S. Patent Application Publication 2004/0001268 Deeman et al.

A. Amendments to the Claims

Independent claims 1, 5, and 9 of the present application have been amended to clarify the claimed invention. Claim 1, for example, has been amended to recite "calculating a varying spacing distance between the read element and the write element measured along each data track of the hard disk as a function of a radius of the hard disk, wherein the varying spacing distance between the read element and the write element varies from track to track at different distances from a center of the hard disk; and

writing data tracks on the hard disk at varying distances from the center of the hard disk so that lengths of unused areas between data sectors and subsequent servo samples in each of the data tracks on the hard disk are substantially equal to the varying spacing distance between the read element and the write element as measured along a corresponding data track of the hard disk."

B. Support for the Amendments

Support for the amendments to claims 1, 5, and 9 can be found in the present patent application.

For example, support for "a length of unused areas between data sectors and subsequent servo samples in each data track of the hard disk is substantially equal to the varying spacing distance between the read element and the write element as measured along a

corresponding data track of the hard disk" can be found, e.g., in Figures 5A-5B. Figures 5A and 5B illustrate that the lengths of the unused areas in regions 401 vary based on the varying spacing distance between the read element and the write element at the center of the hard disk compared to the outer edge of the hard disk. Also, page 6, paragraph 27 states that "Figures 5A and 5B respectively depict the physical arrangement of the angle of rotation of the rotary actuator and *the physical separation of a read element 501 and a write element 502 of a read/write head 503 toward a center of a hard disk and toward the outer edge of the hard disk that give rise to the shape of unused area 401*." (emphasis added)

Further support can be found on page 7, paragraphs 28-29, "Read element 501 must become active and read, or sense, every servo sample. Write element 502 must turn off before it reaches the beginning 507 of the servo sample. Unused area 401 is a small area that is between the end 508 of customer data track 506 and the beginning 507 of servo sampled 504. Unused space 401 has been conventionally assumed to be the same for all angles of the actuator stroke and so insignificant as not be worried about. Nevertheless, portion 402 of unused area 401 (Figure 4), which is closer to the center of hard disk 202, is narrower than portion 403 of unused area 401, which is closer to the outer edge of disk 202. FIG. 5B shows a portion 509 of unused area 401 that is utilized by the present invention that would otherwise be wasted because of the conventional assumption of the uniformity of unused space 401."

Additional support can be found on page 9, paragraph 36, "FIG. 12 depicts a *portion 1204 of unused area 1201 that can be utilized for customer data* after the format efficiency of a hard disk drive 1200 has been improved based on a mathematical calculation of *the spacing distance between the read sensor and the write element as a function of the radius of hard disk drive 1200* according to the present invention. In FIG. 12, hard disk drive 1200 includes a suspension 1205 of a rotary actuator, and an offset read/write head 1206. *The increase in format efficiency is depicted as 509 in FIG. 5B as a function of track length 506.*" (emphasis added)

Support for the varying spacing distance between the read element and the write element and its effect on the spacing loss can be found in the present application, e.g., in Figure 9 and on page 8, paragraph 35, "FIG. 9 depicts that the spacing loss decreases at the outer and

inner diameters of a hard disk. In FIG. 9, a read/write head 900 having a read element 901 and a write element 902 is depicted near the inner diameter 910, at zero skew 920 (i.e., E = 0°) and near the outer diameter 930 of a hard disk with respect to a servo sample 903 and customer data 904. Near the inner diameter 910 and near outer diameter 930, the respective separations 911 and 931 between the read element 901 and write element 902 are reduced in comparison to separation 921 when read/write head 900 is at zero skew 920."

Further support can be found in Figure 10 and in paragraph 36 on pages 8-9. "Figure 10 shows a graph of the areal space loss in nanometers as a function of radius for a hard disk rotating at 10,000 rpm." In the example of Figure 10, the areal space loss varies from 7.48 nm at the inner radius of the hard disk, to 7.85 nm near the middle radius of the hard disk, to 7.65 nm near the outer radius of the hard disk. Figure 10 also supports new claims 15-20.

C. Discussion of the Cited Prior Art

1. U.S. Patent 4,851,933 to Sugaya et al.

U.S. Patent 4,851,933 to Sugaya et al. does not disclose or suggest the features of amended claim 1. Specifically, Sugaya et al. does not disclose or suggest writing data tracks on a disk so that lengths of unused areas between data sectors and subsequent servo samples in each data track of the hard disk are substantially equal to the varying spacing distance between the read element and the write element as measured along a corresponding data track of the hard disk, as recited in amended claim 1.

Also, Sugaya et al. does not disclose or suggest varying lengths of unused areas between data sectors and subsequent servo samples from track to track.

Sugaya et al. states that, "Gap2 28 is an unused area provided according to the spacing between the R/W gap and erase gap." Sugaya et al. col. 4, lines 64-65. This passage does not disclose or suggest varying the lengths of unused areas between data sectors and subsequent servo samples from track to track by making the lengths of the unused areas in each track substantially equal to the varying spacing distance between the read and write elements as measured along each corresponding data track.

Sugaya et al. also states that, "As mentioned above, the unused area provided at the end of the data field can be reduced by setting the erase gate signal high on each track of the disk prior to setting the write gate signal high, by a time corresponding to the number of bytes that corresponds to the spacing between the erase gap and the R/W gap. This number is minimum at the outermost track and is maximum at the innermost track. It is not practical to change the termination timing of data erase for each of the tracks. It is, however, practical to divide the data tracks of a disk into a plurality of groups and vary the termination timing of the erasing action for each track group. The following explains the case where the data tracks are divided into four groups." Sugaya et al., col. 7, lines 43-56. This passage does not disclose or suggest setting the lengths of unused areas between data sectors and subsequent servo samples in each of the data tracks on the disk substantially equal to the varying spacing distance between the read and write elements as measured along a corresponding data track.

Also, Sugaya et al. does not suggest varying the lengths of the unused areas from track to track. For example, figures 10A-10G of Sugaya do not show the length of Gap 1 varying at different distances from the center of the disk.

2. Combination of Sugaya et al. with Brown et al.

It would not have been obvious to one of skill in the art at the time the invention was made to combine Sugaya et al. with U.S. Patent 5,682,274 to Brown et al. to achieve the invention recited in amended claim 1. Specifically, Brown et al. describes a technique for reducing the track pitch (also known as the track width), not for reducing the lengths of unused areas between data sectors and subsequent servo samples. See e.g., Brown et al. at col. 3, lines 5-9, and lines 47-49. See also, Brown et al. at col. 2, lines 53-56.

Sugaya et al. describes a technique for varying the timing of an erase action for 4 groups of data tracks. See e.g., Sugaya et al., at col. 7, lines 52-56; and col. 8, lines 12-47. Sugaya et at. does not disclose or suggest varying the lengths of unused areas between data sectors and subsequent servo samples in each data track by setting the lengths of the unused areas to be substantially equal to a varying separation between the read element and the write element as measured along each corresponding data track.

It would not have been obvious to combine the teachings of Sugaya et al. with Brown et al., because Brown et al. does not disclose a technique for improving the format efficiency of a disk by reducing the lengths of unused areas between data sectors and subsequent servo samples. Therefore, one of skill in the art would not have been motivated to apply the teachings of Brown et al. to the teachings of Sugaya et al.

For at least these reasons, it is respectfully submitted that amended claim 1 and its dependent claims is novel and non-obvious over the cited prior art references. Amended claims 5, 9, and their dependent claims are also allowable over the cited prior art references for similar reasons.

CONCLUSION

Applicant believes of the pending claims are now in a condition for allowance. The Examiner can contact the applicant's representative at 650-242-8300.

Respectfully submitted,

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